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ABSTRACT

A 1984 study of the Seattle Public Schools evaluates the relationship between curriculum practices and academic achievement. The study focused on mathematics curriculum and gathered data through survey questionnaires of elementary, middle, and high school level teachers. Three instruments were used: a school assessment questionnaire, a mathematics objectives survey, and a mathematics materials survey. The data from the materials and objectives surveys have not been analyzed, but data from the assessment survey and preliminary information on academic achievement are presented in this paper. Preliminary findings reveal important differences in academic achievement of intermediate students by ethnic category. The most critical finding is that curriculum alignment seems to contribute negatively to achievement of white students, but positively for Black and Asian students. These findings suggest a need for closer evaluation of the data on curriculum objectives and materials surveys. If further analysis confirms this correlation, then demands for strict adherence to a single district-developed curriculum need to be examined. Further questions to consider are whether this study measured curriculum alignment or faculty responses to issues on the survey. Three appendices are included. (MD)

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CURRICULUM ALIGNMENT MEASURES OF EFFECTIVE SCHOOLS: FINDINGS AND IMPLICATIONS

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CURRICULUM ALIGNMENT MEASURES OF EFFECTIVE SCHOOLS: FINDINGS AND IMPLICATIONS

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A strong curriculum is one of the elements that comes to mind the minute we think about a good school. A fine climate or strong leadership or any other factor matters little if the curriculum offered to the students is of poor quality. Yet surprisingly little attention has been focused on the curriculum of effective schools, much less on the curriculum alignment issue that is the subject here. Curriculum alignment, that is, the ideal state of congruence between what is planned and what is taught, was designated as one of the 12 criteria of effective schools in the Seattle Public Schools/ University of Washington, College of Education Effective Schools Project. The belief was expressed that there was a positive relationship between academic achievement of all children in a school and the degree to which the teachers of that school actually followed the district curriculum. While there may be legitimate questions about the validity of the district curriculum, we will have to leave them to others to explore. We will focus here on describing our attempts to develop measures of curriculum alignment and our further attempts to examine the relationship of that alignment measure to academic achievement in the schools. Although we have only preliminary data at this time, we have begun to consider it to prepare for further, computer-assisted analysis in the near future. Our progress to date may help others to avoid some pitfalls and to focus on productive approaches to this area.

A Brief History

In February 1982, this large urban school district published a report developed by a ten-member "Decision Seminar" on effective schools. The report evolved from input from community members, administrators and staff, and from an analysis of the research on effective schools. In April of that year the district's school board adopted the policy recommendations in the report, and the school district formed a collaborative agreement with the University of Washington, College of Education to implement the district's project to attain effective schools.

The seminar group had generated a list of twelve characteristics of an effective school, of which "curriculum continuity" was one. Their curriculum continuity statement, was given to the curriculum task force, a sub-group made up of two curriculum administrators and a teacher from the district, and two members of the College of Education. The task force, one of 12 established to refine the early definitions, was to proceed to map out tasks requisite to

determining the degree to which schools exhibited this characteristic.

The task force perceived that the statement presented by the seminar was really not one that defined curriculum continuity, but was rather a policy statement regarding curriculum alignment. (See Appendix A for early and later refined statements.) The school district was interested in whether the curriculum as noted in the district's documents such as the elementary curriculum summaries and secondary course summaries was indeed being taught, and whether the district adopted texts and materials were being used. The task force refined the District's statement, submitted it for review by the original seminar group, who, after small additions, agreed to the changes. The characteristic has continued to be called curriculum continuity within the district, but we will continue the discussion here referring to it by the more appropriate term, curriculum alignment.

Instrument Development Process

There were essentially three questions to be answered by the methods we were to devise:
1. What was actually being taught by the teachers?
2. How similar was this to the district curriculum as expressed in district documents and adopted texts?
3. Did greater alignment actually correlate with academic achievement for all students?
The answer to the third question was one which the district seminar group took as a given, but for which we had no substantiation from other effective schools studies, or, indeed, from other schooling studies in general.

Because a total curriculum review was recognized to be beyond the capabilities of the district to perform or analyze, some aspects of the assessment were narrowed to focus only on the mathematics curriculum. And, though we recognized the limitations it would mean, we further chose to gather data by survey, rather than undertaking classroom observations as one might for a smaller-scale assessment. Working with these two limitations, then, we began to develop assessment strategies for use at the elementary, middle, and high school level to discover how closely the teachers were following the district curriculum.

School Assessment Questionnaire. The major instrument addressing all 12 effective school characteristics was to be the school assessment questionnaire. Each task force could developed items for this document. The curriculum task force generated a series of 15 items which surveyed the teachers' use of district curriculum documents and texts in relation to lesson planning, goals, content, learning activities, evaluation, resources and materials. After piloting the items with groups of teachers from the district, the items were factor analyzed and reduced to five which showed a significant loading on one factor. The five items were the following:

* I rely heavily on use of the district adopted textbook for my teaching.
* District curriculum documents guide my planning of instruction.
* District adopted textbooks guide my planning of instruction.
* I rely heavily on use of district grade level curricula for classroom lessons.
* The content the district specifies for my courses or grade level is important.

In the final survey presented to all teachers in the district, the teachers were asked to respond on a five point continuum labeled "strongly agree, agree, unsure/undecided, disagree, strongly disagree". Teachers from nearly all 110 schools responded to the final survey, though some schools had too few respondents to make inclusion appropriate in a school by school analysis.

Mathematics Objectives Survey. To further examine the teachers' focus on district objectives in mathematics, a separate survey was developed (See Appendix B). Teachers were asked to indicate the time spent on each math objective, the school quarter in which they addressed the objective, and how they judged the objective's worth in the curriculum.

Mathematics Materials Survey. Finally, the teachers were given a separate mathematics curriculum materials survey in order to determine just which books and which segments of those books were being used (See Appendix C. for sample).

Administration of the Instrument

All teachers in the school district were given the teacher assessment questionnaire. (Comparable forms were completed by administrators and parents, but those data will not be discussed here.) The survey on objective and the survey of materials were completed only by those who taught mathematics. Teachers were asked to fill out the surveys in meetings schedule specifically for that purpose by the principal in May 1984. Responses on the school assessment questionnaire were recorded on mark-sense forms for computer analysis. Responses on the other two surveys were to be transferred to key-punched data cards later (this has yet to be done.)

Preliminary Findings

Because the materials survey and the objectives survey have not been transferred to the computer for analysis, much of the data about actual teacher practices is unavailable. We do have data from the assessment survey and preliminary information on academic achievement by the three primary ethnic groups: White, Black, and Asian. There was wide variance in the number of respondents from the over 100 schools of the district. Some schools are just small, and

therefore have a small number of teachers. Others had more teachers, but few chose to respond to the survey due to suspicion of the motives for the surveys, lack of interest, and any number of other reasons. Still, there were a number of interesting patterns arising from the initial analysis, and these will be closely watched as computer assisted analysis is completed.

The objectives survey would be the closest approximation to actual classroom observations in answering the first question about what was actually being taught by the teachers. The materials survey would substantiate, to some degree, the teachers responses in the objectives survey. Without that data, we must turn to the five items and combined scores on the general school survey to determine if, by the teachers reports, they are teaching what the district has prescribed, with the materials the district has adopted.

Before looking at the survey item results, some general differences must be noted. First there seem to be differences in the way elementary, middle, and high school teachers responded to the survey items. When the five items were combined to give a mean score for curriculum, differences could be seen between elementary and the two secondary groups. When each item was considered separately, differences appeared among all three. When elementary students are divided into primary (1-3) and intermediate (4-6) and their achievement is examined in relation to the curriculum alignment factor, some differences can be found among ethnic groups. Let us look briefly at the data on each of these three issues, and then examine the data from elementary schools more closely.

Curriculum alignment mean scores. The combined mean scores of the five curriculum items can be compared for gross differences in responses patterns at the three different school levels (See Table 1). Generally the higher scores (maximum score of 25) mean the teachers of a school are in agreement that they do follow/use district curriculum documents and texts. The more ambiguous mid-range scores show that the teachers are either more evenly distributed across the five possible responses, bimodally distributed, or generally undecided. Lower range scores indicate the teachers are in agreement, but they agree that they do not follow/use district curriculum documents and texts.

Table 1.
Mean Scores for Curriculum Component by Level

Level	Mean Score	Range
Elementary	17.14	13.40--20.80
Middle	15.41	14.00--16.40
High School	15.21	13.80--16.50
All District	16.61	13.40--20.80

The elementary schools presented a higher mean score

than the high schools and middle schools, but the range of scores for elementary schools was also greater; elementary schools presented some composite scores both higher and lower than any middle or high schools. The high school and middle school means of 15+ suggest that there is less agreement/ or more unsureness among the teachers (since 15 is a perfect midpoint score), but not a distinct movement toward repudiation of the district curriculum as might be found among the lowest scoring elementary schools.

Differences in items by level. Because the combination of items may mask some important differences, mean scores on each of the five items were next reviewed (Table 2 not included due to length). The total district response to the items about reliance on adopted textbooks was bimodal, and so too were the responses of teachers at each level. When it came to the use of district curriculum summaries, however, the elementary schools reported greater use, while the secondary schools tended to be dispersed across the mid-range of responses. Though high school and elementary teachers generally agreed about the importance of texts in the guidance of their planning, middle school teachers showed less agreement. High school teachers tended to agree that they did not rely on district grade level curricula for classroom lessons, middle school teachers responded bimodally, and elementary teachers were a bit more positive. Finally, the teachers at all levels were generally positive about the importance of the district-specified content for their courses.

These differences in general response patterns at different levels on three of the five items suggest that interpretation and comparisons across levels be very carefully undertaken.

Elementary curriculum alignment and academic achievement Rather than deal with the complexity of cross level comparisons, let us look next at the curriculum alignment scores of staff in relationship to academic achievement in mathematics and reading for primary and intermediate student. The question, you will remember is: Does greater curriculum alignment correlate with academic achievement for all students? The staff curriculum alignment factor correlated highly with all other staff ESP characteristic variables except one (sex equity), but it correlated not at all with academic achievement in any of the reading, language arts, or mathematics sub-scales or total scores. Nevertheless, when multiple regression was used to examine the factors contributing to academic achievement in reading and mathematics for primary and intermediate students by ethnic category some important differences were evident (See Table 3).

Table 3.
Curriculum Alignment Contributions to
Variance in Academic Achievement Test Scores

	Reading	Mathematics
Primary		
White	.05 -	.09 -
Black	.02 -	.00 -
Asian	.00 -	.00 -
Intermediate		
White	.09**-	.05 -
Black	.04* +	.12* +
Asian	.01**+	.03 +

* Significant at .05
** Significant at .01

The variance in mathematics and reading achievement contributed by staff responses to the curriculum alignment factor items was neither statistically significant nor meaningful at the primary grade level for any of the three major ethnic groups. But variance in achievement at the intermediate grades presents a different picture. The curriculum alignment factor contributed 9 percent of the variance in total reading achievement for White students, 4 percent for Black students, and 1 percent for Asians. It contributed 5 percent of the variance in total mathematics achievement for white students, and a higher, 12 percent for Black students. Perhaps the most critical piece of information is that curriculum alignment contributed negatively to achievement of intermediate White students in both mathematics and reading, but positively for Black and Asian students. In other words, the more teachers claim to adhere to district curriculum, the worse white intermediate students score on achievement tests, and the better Black, and to some degree, Asian students score on achievement tests.

Implications

Certainly, with figures that suggest these differences by ethnic groups, the analysis of data collected through the curriculum objectives and materials surveys becomes increasingly important. If it is determined through those analyses that teachers who claim alignment with the district curriculum are, in fact, reporting accurately, then some serious questions arise. Why, for example, would there be a strong positive relationship between curriculum alignment and

the achievement of Black students, but a negative relationship between alignment and the achievement of White students? And if a district-developed curriculum and subsequent adherence to it are actually negatively related to academic achievement of one group, what must this suggest about the appropriateness of demands for strict adherence to a single district-approved curriculum? Those who have long held that district-wide curriculum decision-making, particularly in large districts, is counterproductive in meeting student needs, may find support here for greater building-based planning.

But all of this is highly speculative until further analysis of the data is done. The first important issue to be settled is whether the so-called curriculum alignment factor is really measuring what it claims. It is possible that what we have is a measure, not of curriculum alignment, but of faculty cohesiveness, morale, or cynicism, all expressed through items about curricular issues. The delays resulting from the cumbersome aspects of the objectives and materials surveys make it impossible for us to put that issue to rest just yet. For that reason, we highly recommend that those who wish to explore curriculum as an element of effective schools apply themselves to the development of an easily-manipulated "computer-friendly" data base. Alternatively, they may wish to employ a curriculum mapping strategy based on observational data to spot check the validity of teacher-reported practices.

Finally, we recommend that separate analyses be carried out at each level of the schools so that differences among them will not be masked. We know that primary teachers, students, and curricula are very different from their high school counterparts; there is evidence that intermediate and middle school levels differ too. Our preliminary analysis of data seems to indicate that there just may be differences in the kinds of curricula appropriate for successful achievement for students of different ethnic groups. Our research on effectiveness must reflect this knowledge of differences or we will do a disservice to all.

Listed below are the benchmark math objectives eighth grade.

Indicate the relative amount of math instructi on the scale to the right of the objective. A of each objective you used by darkening the ap

Objective	Rela Sp	
	None	A limited
The student can:		
1. Count object to 30	[ ]	[
2. Write numeral correctly	[ ]	[
3. Identify numerals out of order	[ ]	[
4. Identify names and shapes	[ ]	[
5. Identify sizes	[ ]	[
6. Understand concept of position	[ ]	[
7. Match numerals and sets	[ ]	[
8. Classify/compare object size, shape and color	[ ]	[
9. Identify a sequence of patterns	[ ]	[
10. Tell which of two sets has fewer or more numbers	[ ]	[
11. Count by 1's to 100	[ ]	[
12. Recognize and write numerals in order	[ ]	[

ctives for the Seattle Public Schools grades kindergarten through

truction time you spent on each objective by darkening the bo
ve. Also indicate how you feel regarding the worth or import nce
the appropriate box under worth of objective.

* * * * * *

	Relative amount of Time Spent on Objective				Worth of Objective				
•	A limited amount	A moderate amount	Quite a bit	A great amount	Very low	Low	Average	High	Very High
]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
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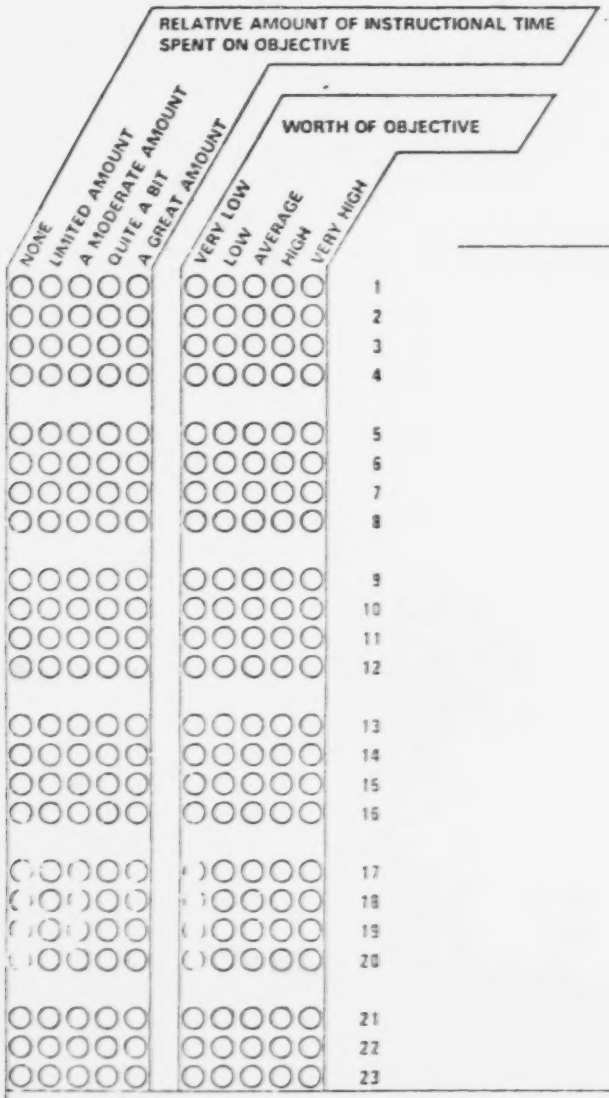
EFFECTIVE SCHOOLS PROJECT - CURRICULUM SURVEY **UNIVERSITY OF WASHINGTON** **SEATTLE PUBLIC SCHOOLS**

- PLEASE FILL IN THE CIRCLES COMPLETELY
- MAKE YOUR MARKS VERY DARK - USE A #2 PENCIL
- MAKE NO STRAY MARKS - MAKE ALL ERASURES CLEAN

SCHOOL NUMBER	GRADE	YEAR OF RESPONSE	PAGE
0 1 2 3 4 5 6 7 8 9	K 1 2 3 4 5 6 7 8	8 9	1
0 1 2 3 4 5 6 7 8 9		0 1 2 3 4 5 6 7 8 9	



DO NOT MARK IN THIS SPACE

Serial #

Listed below are the benchmark objectives for the Seattle Public Schools grades K-8. Indicate the relative amount of math instruction time you spent on each objective by darkening the circle on the scale to the left of the objective. Also indicate how you feel regarding the worth or importance of each objective you used by darkening the appropriate circle under "Worth of Objective."

NCS Trans-Optic MPOB-18051-321

MATH CURRICULUM MATERIALS

Listed below are the instructional materials in mathematics which are available. Please darken the box which indicates the extent to which you used each book. If you did not use a book or do not plan to use a book this year, darken in the box under "none." If you used part of the book, darken the box under "some." If you used the entire book, darken the box "all." If you used parts or sections of a book and marked some, darken the box under the sections that you used.

	None	Some	All	Chapter/Unit/Module
KINDERGARTEN:				
Baratta-Lorton, M. MATHEMATICS THEIR WAY. Addison-Wesley, 1976	[ ]	[ ]	[ ]	[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12]
GRADE 1:				
Eicholz and others. MATHEMATICS IN OUR WORLD, BOOK 1. Addison-Wesley, 1981	[ ]	[ ]	[ ]	[1] [2] [3] [4] [5]
Willoughby and others. REAL MATH, BOOK 1. Open Court, 1980	[ ]	[ ]	[ ]	
Willoughby and others. REAL MATH THINKING STORY BOOK, HOW DEEP IS THE WATER? Open Court, 1980	[ ]	[ ]	[ ]	[1] [2] [3] [4] [5] [6]
Wirtz, CDA BANKING ON PROBLEM SOLVING/ DRILL AND PRACTICE AT THE PROBLEM SOLVING LEVEL, Curriculum Development, 1976/1974	[ ]	[ ]	[ ]	
GRADE 2:				
Eicholz and others. MATHEMATICS IN OUR WORLD, BOOK 2. Addison-Wesley, 1981	[ ]	[ ]	[ ]	[1] [2] [3] [4] [5]
Willoughby and others. REAL MATH, BOOK 2. Open Court, 1980	[ ]	[ ]	[ ]	
Willoughby and others. REAL MATH THINKING STORY BOOK, MEASURING BOWSER. Open Court, 1980	[ ]	[ ]	[ ]	
Wirtz. BANKING ON PROBLEM SOLVING/ DRILL AND PRACTICE THE PROBLEM SOLVING LEVEL. Curriculum Development Associates, 1976/1974	[ ]	[ ]	[ ]	